

30. On the Natural History of Whalebone Whales.

By J. A. MÖRCH, (Christiania) *.

[Received March 3, 1911: Read April 4, 1911.]

(Text-figures 160-163.)

No period in the annals of modern whaling exhibits such an intense activity as that which has been developed during the course of the last two years, after the pioneer expeditions of the preceding years to antarctic, subantarctic, and other waters in the Southern Hemisphere had demonstrated the wealth of Cetacea which is to be found in some of these localities. The rise in the price of oil to figures which, through shortage in the crop of oil-seeds, have not been obtained for the last twenty-five years, has had a further stimulating effect upon the development of this pursuit in those southern waters.

The situation to-day, then, is that, after the short run of six years, whaling in the Southern Hemisphere has attained a commercial importance entirely overshadowing that of the industry in our northern latitudes, which is now more than forty years old. As an example, it may be mentioned that last season, from the island of South Georgia alone, fourteen whaling steamers brought 106,800 barrels of oil, which is more than the world's total production of whale-oil three years ago!

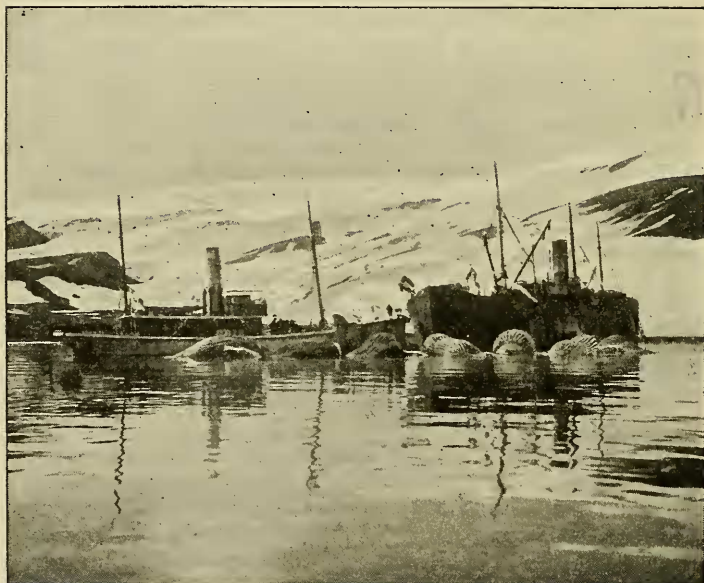
Even during the latter part of the last century the attention of Norwegian whalers was directed to these distant regions; and in 1893 two expeditions started from Norway to try their luck in the chase of Seals and Right Whales in southern seas. One, in the 'Antarctic,' proceeded to Australian waters, and the other, in the 'Jason,' to the islands south-east of Cape Horn. The pecuniary results were not encouraging, and further attempts were given up for the time. Then came the Nordenskiöld scientific expedition in 1901, and Capt. C. A. Larsen, in the 'Antarctic' belonging to that expedition, had an opportunity of continuing his observations made during his previous voyage in the 'Jason.' Having satisfied himself of the seemingly limitless numbers of whales in those waters, he succeeded, in 1904, in interesting parties in Argentina in his plan for establishing a whaling-station on the island of South Georgia; and he began operations there about the new year, 1905.

Meanwhile, in 1903, the Norwegian Storting had passed a law prohibiting whaling on the northern coasts of Norway, and the now homeless whalers had to go in search of other fields for their operations. In the spring of that year a comparatively small vessel was fitted out as a floating factory and dispatched to Spitzbergen as an experiment. This proved successful; and in the next summer a larger vessel proceeded to these waters,

* Communicated by S. F. HARMER, Sc.D., F.R.S., V.P.Z.S.

with the same result. The floating factory, which was going to play such an important part in the development of modern whaling, became hereby an established fact; and in October 1905 this same vessel, together with two whaling steamers, was dispatched to the Falkland Islands and South Shetland. Upon the vessel's successful return with a nearly full cargo of oil in June 1906 the ice was broken; and now followed with intense activity the fitting out of a number of floating factories, as also of buildings and appliances for the erection of land stations in various localities in the Southern Hemisphere.

Text-fig. 160.



Floating factory and whaling steamer in harbour, Deception Island, South Shetland; with floating carcasses of Humpbacks.

From the southern coasts of South America, South Shetland, the Falkland Islands, South Georgia, the coasts of South Africa, and Kerguelen Island, whaling is now being prosecuted with an ever-increasing number of whaling steamers and with returns of oil undreamt of only a few years ago.

The species which are principally hunted are the Humpback Whale (*Megaptera boops*), the Blue Whale (*Balenoptera sibbaldii*), and the Finback Whale (*B. musculus*); and, in one locality (the Falkland Islands), the "Seihval" or Rudolphi's Whale (*B. borealis*), which also occurs on the coast of Chili and the west coast of South Africa without having been actually hunted there yet.

The Sperm Whale (*Physeter macrocephalus*) and the Southern Right Whale (*Balæna australis*) are occasional visitors in some of the localities; the latter species having been observed nearly every year trekking in schools along South Georgia and towards the Patagonian coast. At South Shetland, Bottlenose Whales (*Hyperoodon rostratus*) have also been observed in small schools, but have not been the objects of pursuit. The appearance of this species near the coast in Bransfield Strait is interesting, but as none were caught no observations could be made upon what constitutes their food in this locality.

Humpbacks constitute the great bulk of the Whales caught in most of the above-mentioned localities. The cow of this species is supposed to go pregnant from ten to eleven months, and, judging from their numbers there, must be the most prolific of Whales. In February 1910 I observed at South Shetland two Humpback fetuses about $2\frac{1}{2}$ feet long which, if we accept the supposition of the late Prof. G. Guldberg as to the growth of Humpback fetuses, should be about $2\frac{1}{2}$ months old (impregnation, therefore, about the first of November). At South Georgia, I am informed, even at the commencement of the season, Humpbacks with calves from about 12 feet long are met with, and fetuses are also found here in their first months of development. According to these observations, the indications are that the Humpback Whales in these southern latitudes may be supposed to give birth to their young at some time in September or October, as against April and the neighbouring weeks in our northern latitudes.

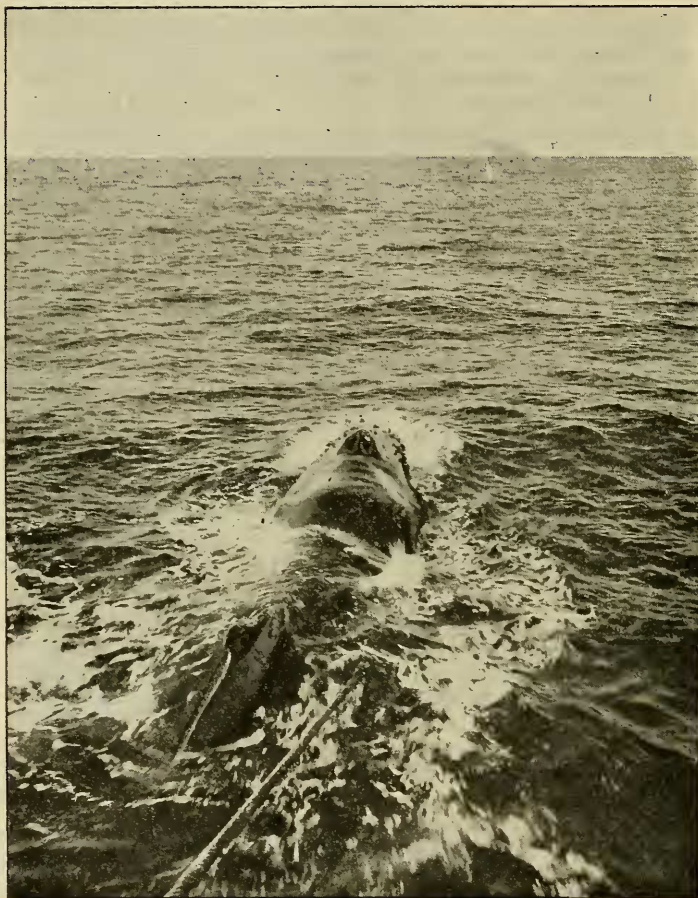
I may add that from the circumstance that in some of these southern localities the Whales are only flensed and the carcasses left to be driven by wind and tide, it is unfortunately only by the merest chance that observations upon the period of gestation of the various species can be made. As, however, a more appropriate disposition of the huge masses of meat and bones may be looked for in the future, opportunities should also present themselves for acquiring enough material for examination in this respect.

An interesting phenomenon is observed from South Georgia relating to the Humpback Whales. At certain times all the Humpbacks that are brought in have the belly nearly white; this variety may then disappear and those caught for some time may have the belly marbled; schools with their bellies entirely dark may then put in an appearance, succeeded by the first variety, and so on. At South Shetland I also observed these several varieties of the Humpback, although they did not there appear in distinct schools, but mingled. The bulls were here in a decided majority, and the individuals observed in February and March were mostly young.

A locality which is attracting serious attention at present is the western coast of South Africa. During the months May to October especially, the Humpback Whales have been observed in

great numbers and mostly off the coast of Portuguese West Africa. I think the question may reasonably be raised whether we have not here the great bulk of the Humpbacks from the South Georgia region on their annual migratory route? In this

Text-fig. 161.



Humpback Whale (nostrils open).

locality, which is interesting in more than one respect, observations might probably be made upon fetuses of Humpback Whales in the later stages of their development. Large schools of Rudolphi's Whales and Blue Whales have also been observed

along these coasts, feeding upon plankton, but the few Blue Whales caught were all very lean.

The coast of Chili, from which whaling is at present being prosecuted, also offers opportunities for interesting observations upon the periods of gestation of various species of Whales, especially those of the Blue Whales and Rudolphi's Whales, which are very little known.

From a consular report which has come to my notice, it appears that great numbers of the Finback Whale congregate in the waters along the Brazil coast between South latitudes 12 and 18 every year during the period from May to November. Until more definite information is obtained upon this subject, further comment must, however, be reserved.

In the Northern Hemisphere, modern whaling is at present being prosecuted from the following localities:—Spitzbergen, Iceland, the Faeroe Islands, Shetland, the Hebrides, the western coast of Ireland, Newfoundland (one station also in Labrador), British Columbia, Japan, and Korea, while preparations are also being made for an early start in Alaska and in the Sea of Okhotsk from Saghalien Island.

When the veteran whaler Svend Foyn had perfected his harpoon-gun in the latter part of the sixties, and had commenced operations in Varangerfiord on the Finmark coast, the Blue Whales were his only objects of pursuit; and, so long as the hunting was carried on on a moderate scale, continued to be so for a series of years. As, however, after the expiration of his patent an increasing number of new companies entered the field, the other species of Whales—Finbacks, Humpbacks, and occasional schools of Rudolphi's Whales—also became the objects of the chase. Successively, however, the Blue Whales became scarcer and scarcer, and the other species of Whales, especially the Finbacks, came to play the principal part in the catches. The same order of things has, as a rule, repeated itself also in most other whaling-grounds in the North Atlantic.

As observations upon the breeding-season and the period of gestation of the various species of Whales in our northern latitudes can only be made during a limited part of the year, no exact information may be said to exist bearing fully upon these questions. The results from the Finmark coast may very briefly be summed up thus:—

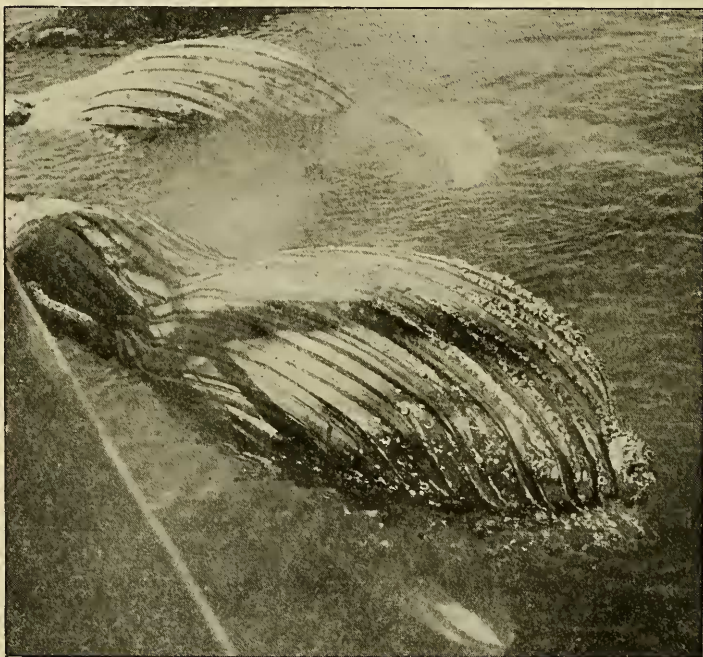
The *Blue Whales* have often been observed in coition during the summer; the indications are that this act may take place also at other times of the year. They have never been observed with small calves in that locality, but occasionally with larger ones. The period of gestation is supposed to last more than twelve months, and it is believed that there is no fixed time of the year when they give birth to their young; this probably takes place in American temperate waters*. Contents of the stomach of

* The Sulphur-bottom variety has occasionally been observed in Finmark waters.

various Blue Whales have been observed by Prof. G. O. Sars to consist chiefly of *Boreophausia inermis*. The Blue Whales are remarkably free from parasites, this perhaps owing to the circumstance that their outer skin easily peels off.

Finback Whales.—Impregnation is supposed to take place in January–March, and the period of gestation to be about twelve months. The length of the new-born calf is about 20 feet. Very young calves are always seen together with full-grown individuals in schools, older calves sometimes in schools by themselves. It is supposed in the locality in question that among 50–60 Finback cows 10–15 will have foetuses and a lesser number will be accompanied by calves. Some cows give birth to their young in those waters, some go westwards to other localities. It is supposed that the cows do not become pregnant every year.

Text-fig. 162.

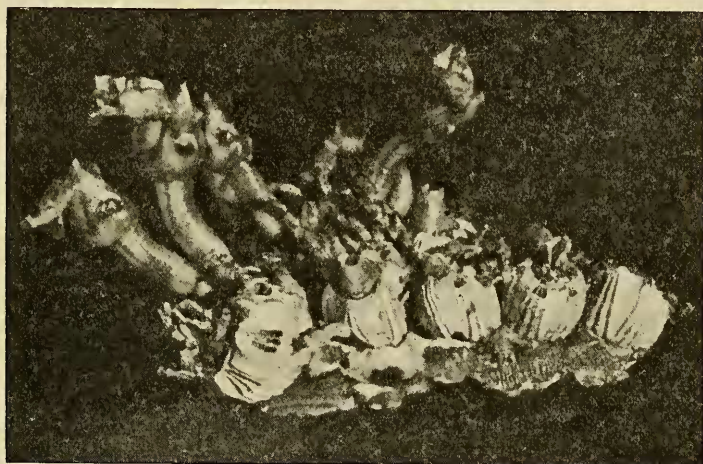


Typical site of Epizoic Crustacea on the ventral surface of a Humpback Whale.

As the Finback Whales in the North Atlantic feed on plankton, caplin (*Mallotus villosus*), and herrings, their distribution at most times of the year depends on the appearance of these various sorts of food. The whalers distinguish three varieties:

the blackish, the grey, and the yellowish. The blackish forms follow the schools of caplin and herrings. The time of appearance of the two other varieties seems to indicate that they feed chiefly on plankton. Further information upon the migratory route of these varieties would be interesting, and observations on the subject might be made during the progress of the herring fisheries. I may add that at South Shetland, in February and March, 1910, I observed several Finback and Blue Whales which were covered by a muddy, yellowish deposit which could easily be scraped off. As I had not a microscope with me, no information upon the nature of this substance could be obtained. *Pennella* is, so far as I know, the only parasite that has been found, and this only occasionally.

Text-fig. 163.



Epizoic Crustacea (*Coronula diadema* and *Conchoderma auritum*)
from Humpback Whale.

Humpback Whales.—During the early months of the year individuals of this species are met with on the Finmark coast going west. They are at that time followed by large calves, are restless, and approach the shores. About April the cows are supposed to give birth to their young in subtropical waters. Impregnation is supposed to take place shortly afterwards. The Humpbacks arrive again in the waters north of Finmark in summer; and around Bear Island they are found in July feeding on plankton (*Boreophausia inermis*, &c.) and caplin, and are then seen with calves about 20 feet long. The foetuses found at this time of the year are about 20 inches long. In September they go east into the Barents Sea, but observations upon their life during the last months of the year are wanting. They are

supposed then to feed on caplin and to follow the schools of these fishes near the "East Ice" and move westwards with them during the winter. Those killed on the westward trek have been found to have empty stomachs.

On account of the tough outer skins of the Humpback, parasites can easily fasten themselves thereto, and this species is, as a matter of fact, especially infested by various forms:—*Coronula diadema*, *Conchoderma auritum*, and *Paracystamus boopis*. *Pennella* is rarely found.

Rudolphi's Whales (*B. borealis*) are very erratic in their appearances. In 1884, for instance, only six were killed on the Finmark coast; in 1885, 659. This is a typical plankton Whale, and it appears on that coast only during the summer, feeding on *Calanus* &c. The fœtuses have a length of from 3 to 4 feet in June, from which it may be inferred that the cows give birth to their young during the latter months of the year in localities at present unknown.

In Shetland in 1906 I observed on a Rudolphi's Whale, which had the front end of its lower jaw deformed, a colony of *Conchoderma auritum* fastened thereto. This is the only instance of parasites on this species that I know of.

Plankton being the only or principal subsistence for the Whales in question, an exceedingly interesting problem is suggested:—What part do the great ocean currents play as highways and feeding grounds for these Whales during their annual migratory route?

From investigations carried on by Prof. Nansen and his assistants it has been proved that the cold polar water has a beneficial effect upon the vegetable life in the open sea. The cold polar currents, by mixing with waters of a higher temperature, create favourable conditions for the growth of plankton and higher marine life.

From these investigations, then, we may infer that it is along the border layers of the great polar currents where these meet and intermingle with warmer currents or waters that, given a sufficient activity of light for the production of vegetable plankton, we may expect to find the most favourable conditions for the subsistence of the plankton Whales.

We know from our northern latitudes that the waters along the northern coast of Iceland, Finmark, and along the western coast of Spitzbergen have attracted and been able to maintain for a long series of years a considerable or even a very great number of Whales.

On the contrary, we have seen that in localities which are under the principal influence of a cold polar current—for instance, the coast of Newfoundland—the stock of Whales has in the course of only a very limited number of years been seriously reduced, although the number of whaling steamers employed would not have been excessive had the same favourable conditions in the sea prevailed as, for instance, along the northern coast of Iceland.

The considerable number of Whales which were met with along the coast of Newfoundland during the earlier years of hunting may probably have accumulated, slowly, during the course of time by natural multiplication, *i.e.* the older ones have been followed by their young and these also have come back to the same locality. If the catches, then, had been proportional to the approximate natural increase, the industry might most probably have been carried on to the same extent for a long time to come.

It may be taken for granted that the great bulk of the Whales which during the spring months migrate northwards through the Atlantic take an easterly direction and spread in a fan-like manner towards Iceland, the Faeroe Islands, Shetland, Spitzbergen, and the northern coasts of Norway. Now the question is: Does the western part of the Atlantic bordering upon Nova Scotia, Cape Breton, and Newfoundland offer them any inducement in the form of sufficient food which they may be supposed to find at this time of the year growing along the border of the Gulf-Stream in various localities? This may, I think, be answered in the negative; and I believe that we have here also circumstances which may have contributed to the condition of things which has manifested itself off Newfoundland.

On the Murman Coast, also, there has been another instance of a similar case. In the eighties, two whaling stations were started here by the Russians, and under apparently favourable auspices as to the number of Whales which were seen in this locality. After a few seasons of successful hunting, however, the Whales became scarcer and scarcer, so that at last their pursuit had to be given up. This agrees also very well with our own experience on the Finmark coast, where the whaling stations in the eastern localities had to be moved westwards at a comparatively early date, as the Whales became scarcer in the colder areas towards the Murman Coast.

If the statistics of the Whale fisheries in some of our northern localities are examined, it will strike an observer that the years of good or poor returns generally run into periods of years of either the one or the other kind. There may one year be foggy or boisterous weather accounting for smaller catches, but these obstructions do not generally last in periods of years. It will take a closer study of the hydrobiological conditions of larger areas during the particular years to give a satisfactory explanation of this phenomenon, and I am only here indicating its existence.

With the latter part of August, or the first part of September, most of the Whales in our northern latitudes have left their summer haunts. The migratory routes of the Blue Whales and the Rudolphi's Whales between the seasons, and to some extent also during these, may well be said to be shrouded in mystery. The two American bomb-lances, which in the years 1888 and 1898 were found in Blue Whales on the coast of Finmark, do not give us much clue as to the particular locality where they had been fired into the animals.

Of the Finback Whales a considerable number must stay in our home waters also between successive summer seasons, following and feeding upon the shoals of caplin and herrings at various localities and times of the year. But their numbers are not so great as to account for the large schools which migrate to southern latitudes. In the Mediterranean considerable numbers of Finback Whales are seen, but further information from this locality is lacking.

In addition to what has been mentioned above with regard to the Humpback Whales, nothing is known about the migratory route of those which visit the waters off Newfoundland and northwards. It would be of interest to know if they follow the caplin in these localities, like the Humpbacks in the Barents Sea.

In the month of May, Humpbacks are found off the Azores, Bermuda Islands, and occasionally the Antilles. In 1899 parts of an American bomb-lance were found in a Humpback on the Finmark coast.

The part played by the Gulf-Stream in the biology of Whales in the North Atlantic is paralleled by the influence exerted by the Antarctic current or great West Wind Drift in the South Sea. The localities which have shown themselves to be rich whaling grounds, such as the coast of Chili, South Georgia, and the southern coast of West Africa, are under the influence of this current. By the intermingling of the cold waters from this current with waters from the adjacent warmer currents, conditions must be created favourable for the production of the masses of plankton which are sometimes seen in these localities. What part the Humboldt current along the western coast of South America and the Benguela current along the western coast of South Africa play as migratory routes and as feeding grounds during several months of the year for those species of Whales which at the present time are of the greatest commercial importance among the Cetacea, must be left to future investigations to disclose.

The geographical positions of the various whaling grounds in the Southern Hemisphere should offer special opportunities for observations upon the migrations, breeding-season, food, and other questions of biological and economical interest relating to these Whales.

EXHIBITIONS AND NOTICES.

April 25, 1911.

Dr. S. F. HARMER, M.A., F.R.S., Vice-President,
in the Chair.

THE SECRETARY read the following report on the additions to the Society's Menagerie during the month of March 1911:—

The number of registered additions to the Society's Menagerie during the month of March last was 270. Of these 73 were acquired by presentation, 137 by purchase, 45 were received on deposit, 8 in exchange, and 7 were born in the Gardens.

The number of departures during the same period, by deaths and removals, was 158.

Amongst the additions special attention may be directed to:—

2 Siamang Gibbons (*Symphalangus syndactylus*) ♀ ♀, from Sumatra, purchased on March 10th.

2 Neumann's Vervet Cercopithecues (*Cercopithecus centralis*), new to the Collection, from Lake Kivu, Central Africa, deposited on March 23rd.

2 Ruffed Lemurs (*Lemur varius*) ♂ ♀, from Madagascar, presented by Frederick Burgoyne, Esq., F.Z.S., on March 15th.

2 Pumas (*Felis concolor*), from Pernambuco, presented by John Sparks, Esq., F.Z.S., on March 11th.

1 Elephant-Seal (*Macrorhinus crozetensis*), new to the Collection, from the Crozet Islands, presented to The King's African Collection by Dr. Louis Péringuey, F.Z.S., and deposited by H.M. THE KING on March 23rd.

1 Gundlach's Troupial (*Quiscalus gundlachi*), new to the Collection, from the Greater Antilles, presented by the Countess of Suffolk on March 2nd.

Mr. C. TATE REGAN, M.A., F.Z.S., exhibited a series of lantern-slides of scales of the Salmon (*Salmo salar*), and showed how the life-history of the fish could be read from its scales.

Mr. D. SETH-SMITH, F.Z.S., the Society's Curator of Birds, exhibited:—

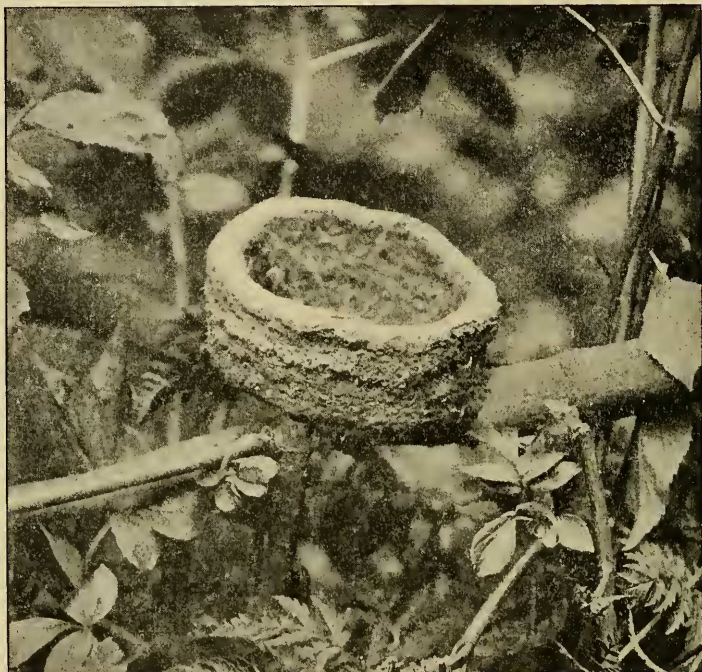
(1) A nest (text-fig. 164, p. 672) of the Grey Struthidea or Apostle Bird (*Struthidea cinerea*), composed entirely of mud, and built on a branch in the Western Aviary.

(2) Lantern-slides from photographs of the King Penguin (*Aptenodytes pennanti*) and Black-footed Penguins (*Spheniscus demersus*) showing the method of moulting.

(3) Lantern-slides of a number of wild Swainson's Lorikeets (*Trichoglossus nova-hollandiae*), from photographs kindly sent by Mrs. Innes, of Mackay, North Queensland. These birds came

in large numbers to feed daily at a table, on syrup provided, settling without fear upon the head, shoulders, and arms of the lady who fed them.

Text-fig. 164.



Nest of the Grey Struthidea.

Some Mammals from Uganda.

Dr. C. CHRISTY, F.Z.S., exhibited specimens from a collection of skins of antelopes, hyrax, monkey, cheetah, serval and servaline cat, &c., obtained in the Chagwe forests in the south-east of the Uganda Protectorate, and made the following remarks:—

“Perhaps the most interesting specimens in the collection before you are those of *Cephalophus weynsi*. This red duiker was first described by Mr. O. Thomas, F.R.S., from two skins from eastern Congo. Subsequently a specimen was obtained by Mr. L. M. Seth-Smith in the Budongo forest on the east of Lake Albert. An imperfect skin in the National Collection, labelled *Cephalophus johnstoni*, also obtained from the Lake Albert region, and described some time ago by Mr. Thomas, may possibly also belong to this species.

“My own four specimens were shot in the Mabira forests more

than 100 miles east of the Budonga, and with very little forest intervening. The locality is a new one, and is probably the easternmost limit of the species, which, after another gap of 150 miles of more or less open country still further east, gives place to *Cephalophus ignifer*, the common red duiker of the East African upland and rift-valley forests.

"The two species are closely allied. In both the body-hair is short and close-laid, and the horns slope backward in a line with the forehead. Amongst other characteristics *C. weynsi* may be distinguished by the hairs on the nape being reversed forward.

"These sleek, heavy, short-legged duikers are very pig-like in gait and appearance, carrying the head low. They are found only in dense forest, and, so far as my experience goes, never even feed in the open, unlike the grey duiker so commonly to be met with at forest-edges and often seen in the open. My two best heads of *C. weynsi* measure $4\frac{1}{4}$ and $4\frac{1}{2}$ inches in length respectively.

"I may also draw your attention to the specimens of hyrax—*Procavia emini* and *P. dorsalis* (?). Naturalists do not seem to quite realise that certain species of hyrax, the *Dendrohyrax* group, are entirely arboreal, never living amongst rocks or holes in the ground, but inhabiting the largest trees in dense tropical forests; whilst other species are rock dassies, and though able to run up and down the face of a perpendicular rock or even to play about the neighbouring bushes, yet are in no sense arboreal. The members of the *Dendrohyrax* group do not even live in hollow trees as a rule, but upon the branches.

"On looking closely at the skins of these two animals, *P. emini* and *P. dorsalis* (?), both killed in high trees, it is interesting to observe that the long bristles amongst the fur, so numerous and so conspicuous, especially on the hinder part of the body, in those species which are not arboreal, are here obviously absent or only to be found on the neck or shoulders. I find, as the result of an examination of the skins in the British Museum, that this distinctive peculiarity holds good for the two groups in almost every instance, the arboreal *Dendrohyrax* group being almost without them, while in the rock-inhabiting species they are very conspicuously developed, mainly posteriorly.

"It seems probable that these long stiff hairs are tactile organs and of very considerable use in dark burrows and holes amongst the rocks; whilst it is easy to see that they are of less utility on the branches of trees, and in time, no doubt, would become rudimentary or disappear altogether.

"The weird, nocturnal, ventriloquistic cries of both groups of these animals are even more extraordinary than their powers of climbing."

Dr. CHRISTY also exhibited a loin-cloth taken in 1898 from the dead body of a native in the Gando-Bornu district of Northern Nigeria. In referring to it, he said:—"When first I caught sight of this ornamental piece of wearing apparel it seemed so peculiar that I stopped to secure it under considerable difficulties.

It is apparently made from the skin of a young *Cobus cob*; but the white of the belly part and the inner part of the hind legs you will see are transversely striped with inch-wide stripes, some two or three inches apart, of a reddish-brown colouring exactly resembling that of the animal. These stripes are doubtless made with some native pigment or dye; but they are so placed and the colour is so permanent, so fixed and difficult to remove by any means, that serious doubts have been entertained, as Mr. Thomas will tell you, as to whether they were artificial or natural markings.

"It will be also noted that the white hair on the striped belly-parts is curled and not unlike sheep's wool, but quite unlike any known antelope. If this curling of the hair in this situation is not natural, I can only suggest that it is produced by the heat and chafing of the wearer's thighs."

Mr. Oldfield Thomas, in commenting upon Dr. Christy's exhibit, stated that there was little doubt that the stripes and curly appearance of the hair were artificial, but the fact that the dye, whatever it was, so closely resembled the natural colour of the animal and appeared to be so "fixed," the possibility of the skin belonging to some antelope hitherto quite unknown had been very carefully considered at the Natural History Museum.

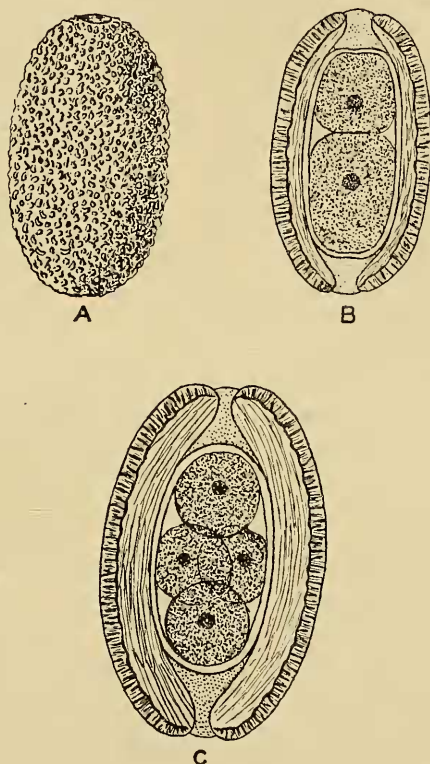
On a unique Pathological Condition in a Hare.

(Text-figure 165.)

Dr. WILLIAM NICOLL, M.A., F.Z.S., exhibited some preparations from a Common Hare (*Lepus europæus*), which showed an interesting and unique pathological condition. The hare was obtained by W. Raphael Muckley, Esq., and sent by him to the British Museum, whence it was forwarded to the Lister Institute of Preventive Medicine. The manner in which the hare died was somewhat remarkable. It was observed by Mr. Muckley to pitch violently out of a hedge on to the roadside where it lay struggling, and it died about three hours later. To him the symptoms seemed to point to poisoning. At the *post mortem* examination the liver was found to be extensively invaded with small whitish chalky deposits of various sizes, especially conspicuous on the posterior surface. There was also a considerable amount of chronic inflammation around the liver, with adhesions to the diaphragm. On section the liver was friable and gritty. The concretions were amorphous and insoluble in acid. The bile-ducts showed some fibrous thickening. On microscopic examination of a scraping from the liver, numerous ova of peculiar structure were seen. They were fairly uniform in size, measuring $\cdot 057 \times \cdot 033$ mm. At first sight they bore a considerable resemblance to the eggs of *Trichuris* (*Trichocephalus*) or *Trichosoma*, but on more careful inspection they presented one or two unusual features. The colour was much lighter, being greyish instead of brown. The shell consisted of two layers, the outer of which was marked with pronounced radial striations; the inner was

constituted of fine concentrically-arranged lamellæ. The two layers were not in close apposition but were separated by a narrow, somewhat irregular space. The egg is thus provided with a double shell. At each pole of the egg there was a small circular aperture, piercing both layers of the shell. The external surface of the shell presented a well-marked papillated appearance, the papillæ being irregularly rounded. Inside the shell

Text-fig. 165.



M.R., del.

Eggs of a Nematode worm from the liver of a Hare.

- A. External surface of egg. B. Optical section of egg: two-celled stage.
C. Egg in four-celled stage with thickened inner wall: from vagina.

there was a thin, continuous membrane investing the egg. The polar apertures were each closed by a plug of homogeneous material which was separate and distinct from the membrane investing the egg-cells. They completely filled the apertures but did not bulge beyond them. The eggs were mostly in the two-celled stage, but a number of them showed four cells.

From the appearance of the eggs it is obvious that the lesions were due to a Nematode worm of the *Trichosoma* group. Search was accordingly made and a number of worms were obtained. In every case, however, they were fragments lacking the anterior and posterior extremities. The longest specimen measured 27 mm. It was a female, full of eggs, and it was very slender. It was narrowest at the anterior end (.14 mm.), the breadth increasing gradually towards the posterior end where it was .23 mm. The cuticle was marked throughout with fine annular striations. The vagina was of considerable length but no genital aperture was seen, so that it must have been far forward. In the vagina a number of eggs were present, which were much larger than those first seen. They measured .070-.078 × .040-.045 mm. The shell, too, was much thicker, the increase being almost entirely due to a great thickening of the inner layer. The polar apertures were somewhat reduced in size and the eggs were for the most part in the four-celled stage.

The lesions in the liver showed much resemblance to those seen in advanced stages of coccidiosis, a very common condition in rabbits. For this reason they might readily be diagnosed as such on cursory examination. This, so far as can be gathered, is the first record of such an infection of the liver of hares or rabbits by parasitic nematodes of this kind.

An analogous condition has not infrequently been met with in rats, and has been reported from Europe, India, and Australia. No record has been made of its occurrence in this country.

Whether this parasite in the hare is the same as that in the rat must remain doubtful, for the descriptions of the latter have hitherto not paid much attention to the character of the eggs beyond mentioning that they resembled those of *Trichosoma*.

An attempt is being made to hatch the eggs and to produce infection in rabbits and rats, but the development is extremely slow even at a constant temperature of 26° C.

In addition to the lesions in the liver the hare had a very heavy infection of *Trichostrongylus retortaeformis* in the intestine and a slight intestinal infection with *Coccidium cuniculi*. The intestine and the appendix, moreover, showed a large number of small calcareous patches, but on examination nothing of a parasitic nature could be detected in the patches. This was of interest from the fact that I had already seen similar patches in the caecum of a Variable Hare, sent me from the Society's Gardens. The liver, unfortunately, was not submitted for examination. That these patches might have something to do with the liver condition was not impossible, for they might be considered as degeneration following injury such as the passage of a worm through the intestinal wall.

The hare, further, showed signs of recent parturition and there was a septic condition of the uterus, and it must remain an open question as to whether death was due to this or to the liver disease.